SCOPE

MAGAZINE OF NAVAL MEDICAL RESEARCH AND DEVELOPMENT

WINTER 2023

NMRC Begins Phase 1 Testing of Diarrhea Vaccine

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ISSUE 3 WINTER 2023

Editor's Desk

Welcome back to THE SCOPE, and happy 2023! We missed everyone over the summer, but we have a strong showing from across the enterprise this issue. Our NMRC public affairs team has been hard at work capturing the efforts of our staff, who are equally, if not more so, hard at work on behalf of sailors worldwide. These past few months, the enterprise has traveled to MHSRS, gone out to sea, and continued the good fight and pursuit of knowledge to advance the state of military medicine. Several of our researchers made time to talk with us about ongoing research efforts, including Dr. Frederic Poly (pictured on the cover with Dr. Renee Laird), and Dr. Biswajit Biswas, who shed light on his own interesting path to phage research for the Navy. Women's History Month.

We hope you find this issue of the SCOPE as edifying to read as it was for us to write. Reach out to our team with any enterprise endeavors you feel might make worthy additions to a future issue!

-Tommy Lamkin

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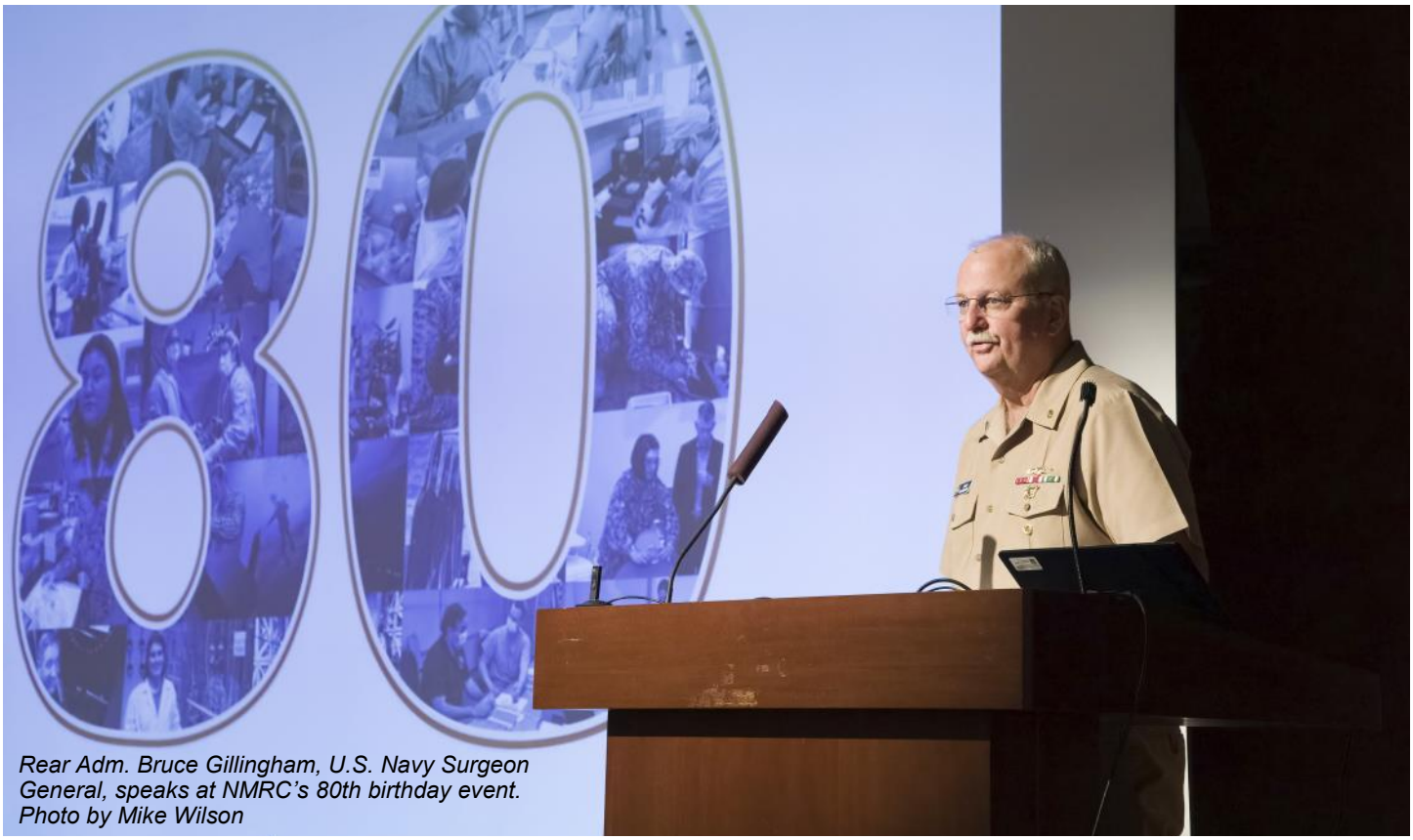
In this issue:

On the Cover:

Dr. Frederic Poly and Dr. Renee Laird pose for a photo in NMRC's Deployment Associated Infections Division laboratory. (U.S. Navy photo by Mike Wilson)



Rear Adm. Bruce Gillingham, U.S. Navy Surgeon General, speaks at NMRC's 80th birthday event. Photo by Mike Wilson

NMRC Marks 80 Years of Supporting Service Members through Research and Development

By Sidney Hinds

Staff of Naval Medical Research Center (NMRC) hosted an 80th birthday celebration to recognize the past accomplishments and future mission of the command on Oct. 27.

The celebration capped off NMRC's Commander Leadership Conference, a three-day gathering of staff from across the Naval Medical Research & Development enterprise to review ongoing work, and to make strategic decisions for the year ahead.

The event featured remarks from Capt. William Deniston, commander, NMRC, leadership from across the enterprise's worldwide commands and Rear Adm. Bruce Gillingham, Navy surgeon general and chief, Bureau of Medicine and Surgery.

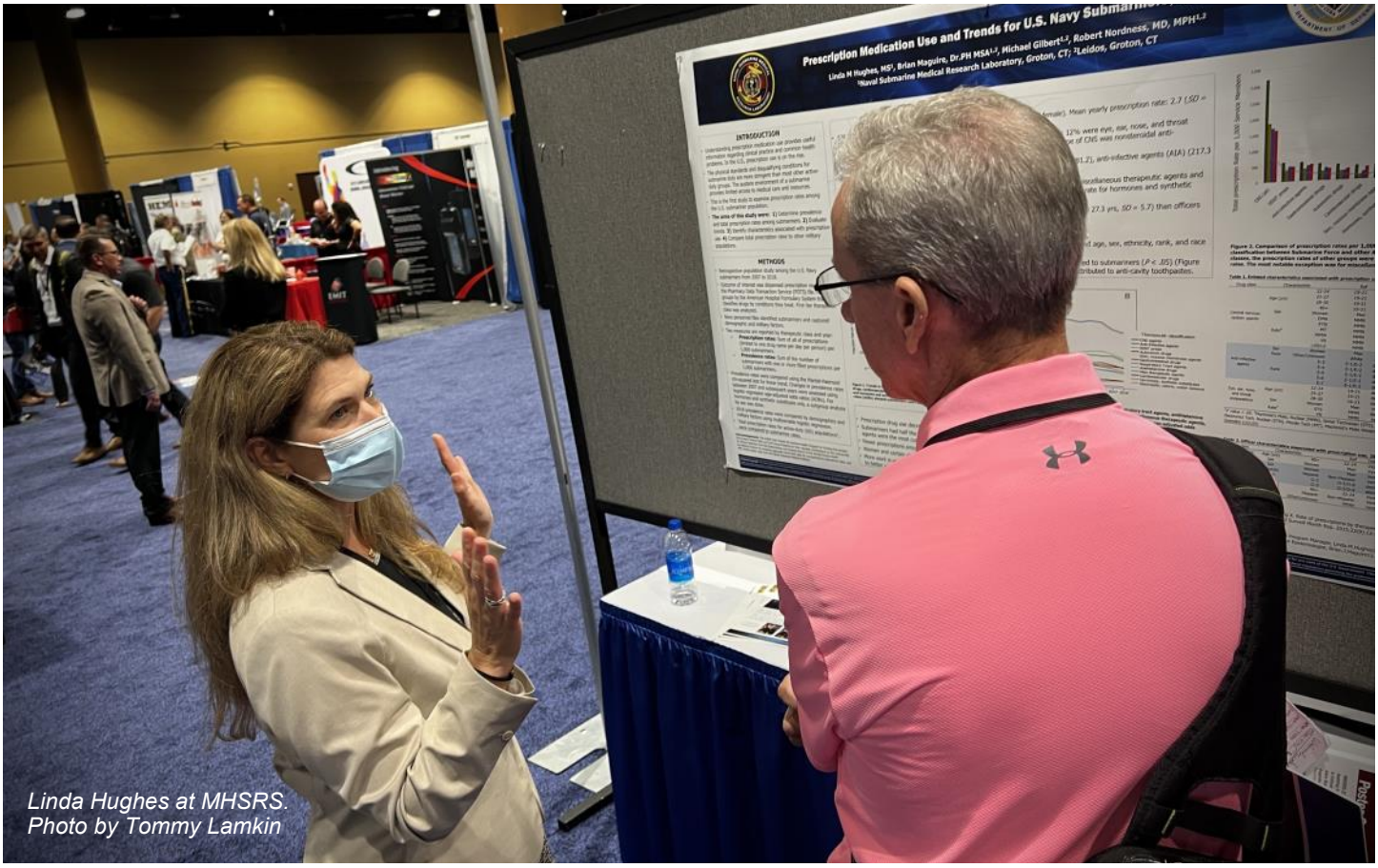
Throughout the conference, and during the birthday event, NMRC emphasized a theme of "Looking back, focusing forward."

"We are launching a new era of support," Deniston said, addressing visitors and enterprise staff. "One in which our support to and focus on the fleet and Marine force is more apparent."

Along with the history of NMRC, speakers highlighted past and recent accomplishments of the worldwide commands.

"It's not easy to summarize 80 years of research and development," said Capt. Abigail Yablonsky, deputy commander, NMRC. "There are countless examples of what research has done to improve the lives of our warfighters and their families. We are evolving all the time – the research we do now is not the research we did in the past, and the research we will do in the future is going to look entirely different from the research of today. We're constantly adapting to new environments, new threats, and new technology."

The National Museum of Health and Medicine also contributed a display of historical items representing work from NMRC's history. ■



Linda Hughes at MHSRS. Photo by Tommy Lamkin

Naval Submarine Medical Research Laboratory Awarded Best in Show at 2022 MHSRS

By Sidney Hinds

Researchers from Naval Submarine Medicine Research Laboratory (NSMRL) were recognized with the 2022 Military Health System Research Symposium (MHSRS) Poster Award for Best in Show on Sept. 15.

The award, presented on the closing day of MHSRS, recognized research with female divers in the U.S. Navy. Linda Hughes, a statistician for NSMRL, and one of the authors for the poster, accepted the award on the command's behalf.

"It's amazing to be selected among all the great research presented at MHSRS", said Hughes. "I'm proud of the work our team has done to be recognized."

"It's amazing to be selected among all the great research presented at MHSRS."

"This is terrific recognition, because women's specific issues in the diving environment have not been previously looked at in great detail," said Dr. David Fothergill, science director for NSMRL. "Our epidemiology group is doing great work at developing our understanding of the stressors encountered in the undersea environment."

"This is a significant step toward identifying the health conditions among women divers, it's a small group that we don't want to overlook", added Hughes.

MHSRS is an annual conference, taking place last year from Sept. 12 - 15 at the Gaylord Palms Resort & Conference Center. This year marks the first in-person occurrence of the conference since 2019.

NSMRL, part of the Naval Medical Research & Development enterprise and based out of Groton, Conn. sustains the readiness and superiority of undersea warfighters through innovative health and performance research. ■

Capt. Franca Jones.
Photo by Cmdr. Marshall Hoffman

NAMRU-6 Celebrates 40 Years of Medical Research

By Sidney Hinds

Naval Medical Research Unit (NAMRU)-6 hosted a 40th birthday celebration at the U.S. Embassy campus to recognize the accomplishments and mission of the command on Jan. 19.

NAMRU-6 hosted several visitors and guests from the U.S. and Peru at the event, to include U.S Ambassador to Peru Lisa Kenna, Rear Adm. Jorge Enrique Andaluz Echevarría, Surgeon General of the Peruvian Navy, Rear Adm. Guido F. Valdes, commander, Naval Medical Forces Pacific and Capt. William Denniston, commander, Naval Medical Research Center. Visitors provided remarks celebrating the history of the command and its ongoing mission.

"The U.S. Navy, and Navy Medicine in particular, take great pride in our ties and partnership with Peru."

"The U.S. Navy, and Navy Medicine in particular, take great pride in our ties and partnership with Peru," said Valdes. "Over the last forty years, what began as a humble laboratory detachment has grown to meet the changing readiness and health needs of U.S. service members, our Peruvian national partners, and global stakeholders."

Capt. Franca Jones, commanding officer of NAMRU-6, took part in a brief panel following remarks, along with past NAMRU-6 commanding officers and researchers from the command and local collaborating institutions. Participants reflected on past NAMRU-6 accomplishments and discussed current command activities.

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Established in 1983 as the Naval Medical Research Institute Detachment, NAMRU-6 was re-named in 2011, and has provided research expertise to aid over a hundred outbreak investigations in Central and South America since 2008. NAMRU-6 staff, a force of almost 300, and comprised of 90% Peruvian nationals, provided detection and identification of the first case of the Zika Virus in Iquitos, Peru. They also aided U.S. allies in the Peruvian Navy with testing for COVID-19 throughout the pandemic. NAMRU-6 collaborates with a network of agencies, universities and hospitals around the globe on these and other medical research missions.

"It has been a privilege to be part of this command's storied history."

Rear Adm. Guido Valdes, commander, Naval Medical Forces Pacific speaks during NAMRU-6's 40th anniversary ceremony. Photo by Monica Barrera

"It has been a privilege to be part of this command's storied history," said Jones. "I look forward to the future and the opportunity to continue making a difference in the world through our work."

NAMRU-6, part of the Naval Medical Research & Development enterprise, supports Global Health Engagement through surveillance of a wide range of infectious diseases of military or public health significance, including dengue fever, malaria, diarrheal diseases, and sexually transmitted infections. ■

Pictured: Capt. Franca Jones, Rear Adm. Guido Valdes and Read Adm. Jorge Enrique Andaluz Echevarría. Navy Photo by Cmdr. Marshall Hoffman

Cmdr. Marshall Hoffman

NMR&D:
MHSRS
WRAP UP

By Sidney Hinds
Photos by Tommy Lamkin

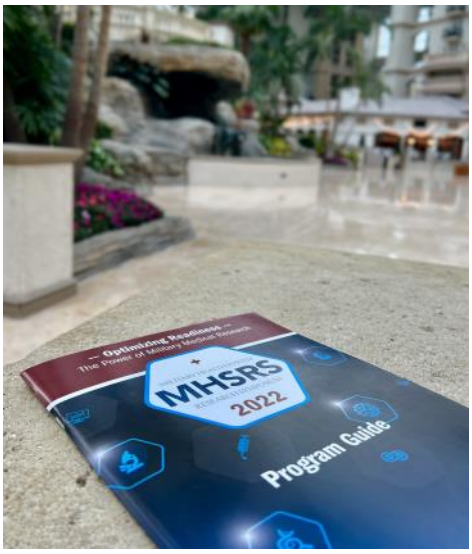
Personnel from the eight commands within the Naval Medical Research & Development enterprise concluded attendance at the 2022 Military Health System Research Symposium (MHSRS) on Sept. 15.

The enterprise personnel, a group of military and civilian research, medical, and support staff, participated in a range of conference activities, presenting at breakout sessions, presenting research posters and engaging with stakeholders throughout the military health system.

"The connections are great," said Capt. William Deniston, commander, Naval Medical Research Center (NMRC). "One of the best parts of MHSRS is seeing people excited about their work, and about being able to talk about their work with their peers in their field. We take that energy of the symposium back to our own work."

A team of researchers from Naval Submarine Medical Research Laboratory (NSMRL) was recognized with the MHSRS Award for Excellence, Research Accomplishment Team/Military. NSMRL's Regional Hearing Conservation Program of Record received the award for work done from Aug. 2021 – Aug. 2022 collecting data on the performance of hearing protection devices used by the warfighter. NSMRL personnel were also recognized with the MHSRS Poster Award for Best in Show.

"It's amazing to be selected among all the great research presented at MHSRS", said Linda Hughes, a statistician for NSMRL. "I'm proud of the work our team has done to be recognized."



"This conference is an important opportunity to exchange ideas and learn what other organizations are developing," said Dr. Jill Phan, NMRC science director, "so we can foster collaborations and create solutions."

"This conference is an important opportunity to exchange ideas and learn what other organizations are developing."

All commands within the enterprise were represented at this year's MHSRS, including NMRC, NSMRL, Naval Health Research Center, Naval Medical Research Unit (NAMRU)-Dayton, NAMRU-San Antonio, NAMRU-2 [Singapore], NAMRU-3 [Italy], and NAMRU-6 [Peru].

MHSRS is an annual conference, which took place last year from Sept. 12 – 15 at the Gaylord Palms Resort & Conference Center. This year marks the first in-person occurrence of the conference since 2019.

The enterprise, led by NMRC, is engaged in a broad spectrum of activity from basic science in the laboratory to field studies in austere and remote areas of the world to investigations in operational environments. In support of the Navy, Marine Corps, and joint U.S. warfighters, researchers study infectious diseases, biological warfare detection and defense, combat casualty care, environmental health concerns, aerospace and undersea medicine, medical modeling, simulation, operational mission support, epidemiology, and behavioral sciences. ■

ADVANCING NAVY MEDICINE IN CONTRACTING & IN UNIFORM

Lt. Brian Williams Shares His Journey Through Military Medical Research

By Sidney Hinds
Photo by Michael Wilson

Editor's Note: As of this writing, Lt. Williams has departed NMRC to serve as deputy department head for biomedical research of the Navy Experimental Diving Unit in Panama City Beach, Florida.

Every service member charts a unique course through their military career, and Lt. Brian Williams is no exception. Having begun work at Naval Medical Research Center (NMRC) as a contractor, Williams made the unusual transition from contractor to officer in the United States Navy.

This move was a pivotal shift for Williams' burgeoning career in military medical research.

Before joining the military or NMRC, Williams cultivated a body of experience in medical science. A native of Endicott, New York, he attended college at the State University of New York at Buffalo. After earning a bachelor's degree in biomedical science and a master's degree in exercise science, he obtained a doctorate in physiology and biophysics. Williams also taught as an adjunct professor for graduate, undergraduate, and medical school postbaccalaureate programs.

The opportunity to work at NMRC presented itself in the fall of 2017, while Williams was seeking a postdoctoral fellowship. Eager to get his foot in the door with military research, Williams left his teaching position at Buffalo and came to Silver Spring, Maryland to begin work at NMRC's Operational and Undersea Medicine Directorate (OUMD). There, he researched a range of areas salient to undersea medicine, including decompression sickness, disabled submarine rescue, and mountain warfare associated hypoxia.

At the time, Williams was working as a contractor for the Henry M. Jackson Foundation for the Advancement of Military Medicine. He wanted to take an additional step into the world of military medical research.

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"I worked with a few NMRC research physiologists – [Lt.] Geoffrey Ciarlone and [Lt. Cmdr.] Joshua Swift. Both were outstanding mentors in an already a great research community," said Williams. "I saw the impact their work had, and I thought: That's exactly the job I want to be doing, and the sort of people I want to work with."

In early 2019, Williams submitted a package in hopes of commissioning as a naval officer and research physiologist. Once accepted, he entered the Navy's Medical Service Corps as a lieutenant and left in September of the same year to attend a five-week course at Officer Training Command, Newport, Rhode Island.

Williams cites his father, a Vietnam War veteran and Navy reservist, as one inspiration for joining the Navy.

"I come from a long lineage of U.S. military service going back 80 years; to include grandparents, uncles and my father. Growing up I saw my father serving in the Navy and I knew if I ever had the opportunity, that would be my branch of choice."

Following training, Williams' career came full circle when he returned to NMRC to continue work with OUMD, this time in uniform. "It's pretty unique," Williams said, regarding his return. "I've met many individuals at NMRC who were prior military, separated or retired, and then came back to NMRC to work as a civilian; I feel like I'm one of the only people I know who did the opposite: left a contractor, and came back as military."

Williams found work at NMRC as a naval officer to be an almost completely different job than it had been as a contractor. In addition to the expectations of his research work, he now bore the responsibilities that come with serving.

"As a [research] contractor, you're a scientists first and foremost," recalled Williams. "Coming back in uniform, you're a naval officer first. Your secondary work is exactly that, secondary. You're expected and required to be an outstanding scientist, and now you have multiple additional responsibilities and tasks on a daily basis."

Active-duty status came with opportunities for immersion into the undersea environment. In 2021, Williams went underway aboard the Ohio-class ballistic missile submarine USS Alaska (SSBN 732), to gain first-hand experience.

"Seeing how the work we do could affect the warfighter put a very different perspective on our research mission. 99% of the time our work goes to affect another fellow service member, and there's always the possibility that at some point the work and research you do may affect you. It puts a face and a new perspective on the work."

In March of 2020, much of the country shut down in response to the COVID-19 pandemic. NMRC's mission grew and alongside fellow research personnel, Williams assisted the command's Naval Infectious Diseases Diagnostic Laboratory in testing of COVID-19 samples, work that continued for several months.

"This was one of my first opportunities to see the difference between being a civilian scientist versus a uniformed scientist; the mission changed, priorities shifted. It really enhanced my perspective that your job as a naval officer is to meet the mission, whatever that mission might be, and no matter how often that mission changes."

For Williams, these changes in focus are all still part of the greater pursuit of medical research. As deputy department head for undersea medicine at OUMD, he has had the opportunity to research the unique medical needs of the Navy's undersea warfighters, to include undersea divers and submarine crew members.

Williams departed NMRC this past fall to serve as deputy department head for biomedical research of the Navy Experimental Diving Unit in Panama City Beach, Florida.

"I'm looking forward to the new and challenging environment. It's an operational command, so a bit different from NMRC and a great opportunity to come into a department as part of leadership."

While NMRC will miss having Williams on staff, his contributions to NMRC have been a great credit to him, and to Navy Medicine at large. Williams himself expressed excitement at the future accomplishments OUMD has ahead of it. ■

NMRC Begins Phase 1 Testing of Diarrhea Vaccine

Story & photos by Michael Wilson

Researchers with Naval Medical Research Center's Enteric Diseases Department have partnered with the National Institute of Health's National Institute of Allergy and Infectious Diseases to begin phase 1 testing of a new Campylobacter jejuni vaccine.

Campylobacter jejuni, a food-borne pathogen, is one of the most common causes of diarrheal illness in the U.S. and abroad, and can impact readiness of deployed or traveling service members.

Phase 1 testing, currently underway at Cincinnati Children's Hospital Medical Center, focuses on the safety and best means of Campylobacter vaccine delivery. Researchers will vaccinate 60 patients in total as part of Phase 1 testing. This first phase of testing is expected to continue through the end of 2023.

Phase 2 testing will involve vaccinating groups of adults with a dose of the vaccine determined in phase 1, to determine its effectiveness in protecting against Campylobacter. NMRC researchers expect to begin phase 2 testing by 2025 at the earliest, depending on funding and the facilities available.

Diarrhea is a frequently occurring illness during military operations, despite modern preventive medicine efforts. The impact of severe diarrhea can be debilitating and impair a service member's ability to do their job. Acute diarrheal illness during deployment is commonly responsible for loss of duty days, negatively affects mission readiness, and may be fatal in the worst cases.

"With really infectious diarrhea, you get cramping, and if you have cramps, you can't really operate."

Courtesy, Cincinnati Children's Hospital

"With really infectious diarrhea, you get cramping, and if you have cramps, you can't really operate," said Dr. Frederic Poly, head of NMRC's Enteric Diseases Department, who has been involved with the project since 2005. "You can develop a fever; you're going to get dehydrated and you're going to lose cognitive perception. These are all symptoms that will negatively impact how you function."

Following recovery from initial infection and bouts of diarrhea, individuals can still experience long-term effects of infection.

"With Campylobacter, there's potential downstream effects, like irritable bowel syndrome or Guillain-Barré syndrome, which can lead to respiratory and neurological issues," noted Lt. Yuliya Johnson, a microbiologist with NMRC. "It doesn't happen to everyone, but there is still an associated risk we hope to mitigate by developing a vaccine."

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According to Poly, this vaccine will be the first developed for use against Campylobacter, and if successful, has the potential to benefit civilian and pediatric populations as well. Vaccination at a young age can curb developmental issues caused by diarrhea that might otherwise affect physical and mental development in children.

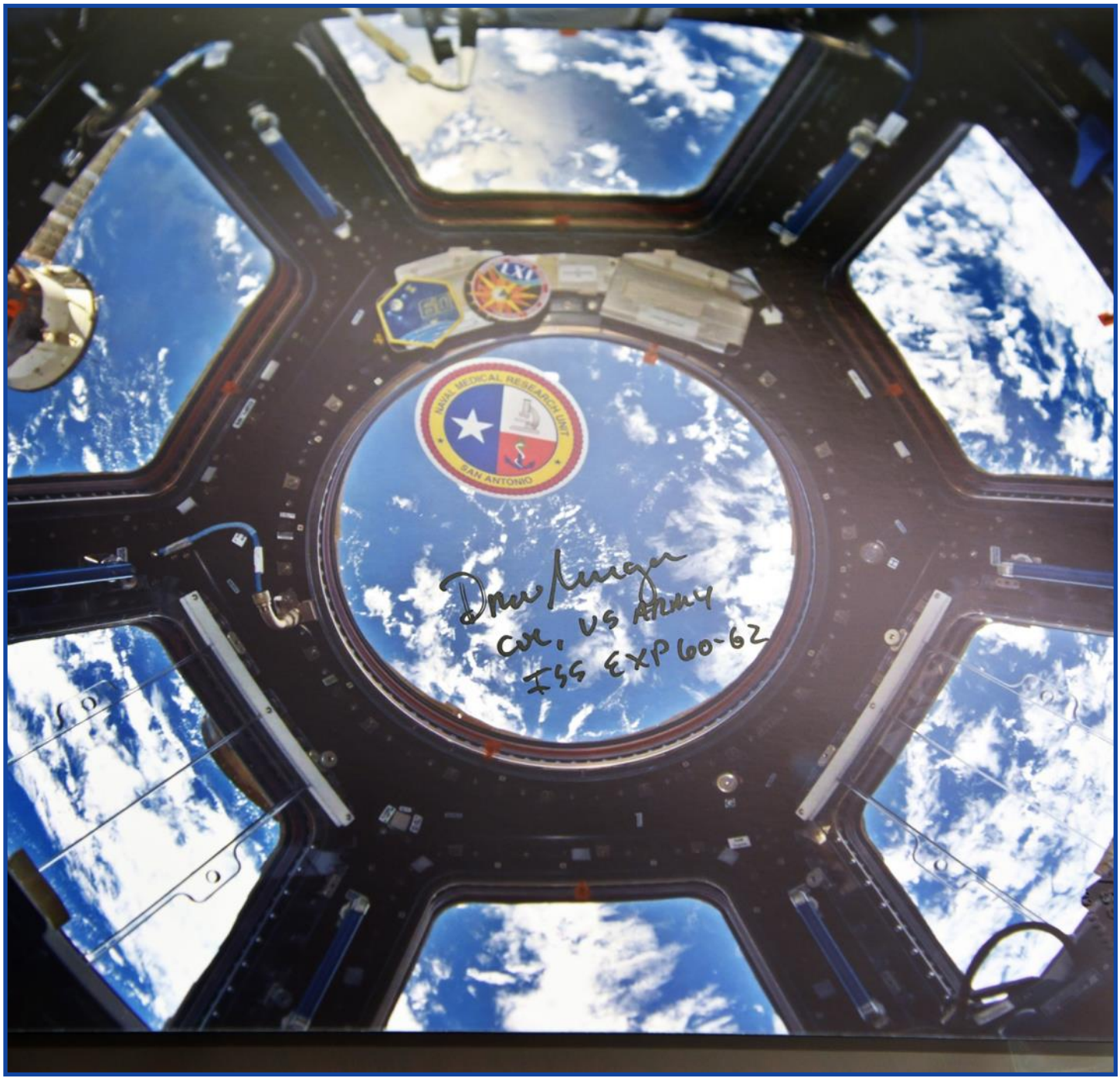
Poly, NMRC's most recent senior civilian of the quarter for science, leads the NMRC Enteric Diseases Department. The department, composed of 23 full time microbiologists, molecular biologists, biochemists, and immunologists, researches treatments for the prevention of infectious bacterial diarrhea.

This past year, the department completed development and clinical evaluation of a prophylactic for another military relevant enteric pathogen, ETEC (enterotoxigenic E. coli). The enteric diseases lab is also working on the development of an oral prophylactic to prevent infection from several other intestinal pathogens.

NMRC and its commands are engaged in a broad spectrum of activity from basic science in the laboratory to field studies in austere and remote areas of the world to investigations in operational environments. In support of the Navy, Marine Corps, and joint U.S. warfighters, researchers study infectious diseases, biological warfare detection and defense, combat casualty care, environmental health concerns, aerospace and undersea medicine, medical modeling, simulation, operational mission support, epidemiology, and behavioral sciences. ■

ITEMS TAKEN TO SPACE RETURNED TO NAMRU★SAN★ANTONIO

STORY & PHOTOS BY BURRELL PARMER



Possessing an object that has been to space is no easy feat. For Naval Medical Research Unit (NAMRU) San Antonio, that is now a reality.

During a presentation held at the Brooke Army Medical Center's Putnam Auditorium, NASA Astronaut, U.S. Army Col. Andrew Morgan returned a command coin and logo sticker which he took with him during his nine months aboard the International Space Station (ISS).

Morgan, the first Army physician in space, launched from the Baikonur Cosmodrome, Kazakhstan, to the ISS aboard a Soyuz (Union) MS-13 spacecraft on July 20, 2019. He served as a flight engineer for Expedition 60, 61 and 62.

During his time aboard the space station, Morgan participated in numerous medical and technological experiments and tasks, as well as several planned high-profile space walks.

"It was an incredible personal honor to meet Col. Morgan," said U.S. Navy Capt. Ewell Hollis, NAMRU San Antonio's executive officer. "NAMRU San Antonio is both humbled and proud to have seen our logo so prominently displayed and carried to space on the exact day of the 50th Anniversary of the historic Apollo 11 mission."

According to Hollis, of Nashville, Tenn., the naval medical research community continues to partner with NASA.

"The list of future astronauts from the ranks of Military Medicine will only continue to grow based on the inspiration from trailblazers such as Dr. Morgan," Hollis said.

NAMRU San Antonio's mission is to conduct gap driven combat casualty care, craniofacial, and directed energy research to improve survival, operational readiness, and safety of Department of Defense (DoD) personnel engaged in routine and expeditionary operations.

"NAMRU San Antonio is both humbled and proud to have seen our logo so prominently displayed and carried to space on the exact day of the 50th Anniversary of the historic Apollo 11 mission."

It is one of the leading research and development laboratories for the U.S. Navy under the DoD and is one of eight subordinate research commands in the global network of laboratories operating under the Naval Medical Research Center in Silver Spring, Md. ■

NMRC Participates in 2022 MARYLAND Fleet Week & Flyover Baltimore

By Sidney Hinds

Petty Officer 2nd Class Griffin Kersting

Tommy Lamkin

Lt. Cmdr. Chaselynn Watters speaks to Fleet Week visitors. Photo by Tommy Lamkin

Sailors from Naval Medical Research Center (NMRC) participated in Maryland Fleet Week and Flyover Baltimore on Sept. 10th.

Leading up to Fleet Week festivities, several NMRC personnel embarked upon the dock landing ship USS Carter Hall (LSD 50) during the ship's short trip from Norfolk to Baltimore Harbor on Sept. 7. NMRC was represented by a mobile lab, a 14-foot expeditionary tent, as part of their presence at Fleet Week. Placed near the stern of the Carter Hall, NMRC personnel gave demonstrations of equipment for outbreak response and the detection of bacteria and viruses to event attendees. Visitors also had the opportunity to learn about the NMRC mission and interact with equipment used by researchers.

"This was a huge opportunity to display how NMRC supports the fleet and US Marines," said Lt. Cmdr. Chaselynn Watters, a microbiologist with NMRC Biological Defense Research Directorate. Personnel embarked aboard the Carter Hall gained first-hand experience of shipboard life and engaged with the crew, discussing their duties in medical research.

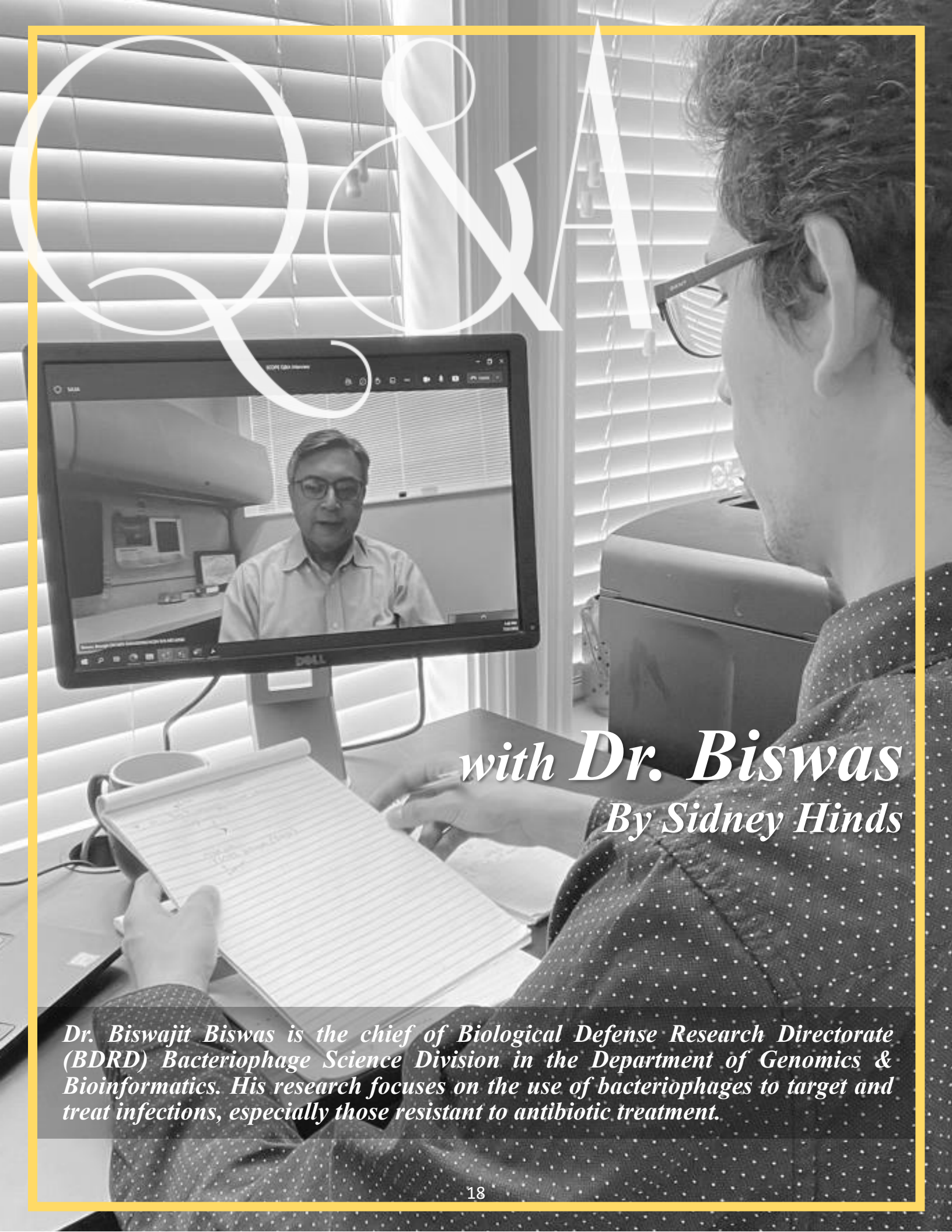
"Being able to see our fleet in action, and getting a better understanding of what the Sailors experience living and working on a ship, particularly what their medical capabilities and constraints are, is invaluable for us on the Navy Medicine side," said Lt. Yuliya Johnson, a microbiologist with NMRC "I will absolutely be able to leverage this understanding to better guide current and future R&D efforts to support the fleet more effectively."

Additionally, NMRC commander Capt. William Deniston attended the opening ceremony and reception for Fleet Week. Enlisted members from BDRD took in the Saturday festivities at the inner harbor.

Maryland Fleet Week and Flyover is Baltimore's celebration of the sea services and provides an opportunity for the citizens of Maryland and the city of Baltimore to meet Sailors, Marines and Coast Guardsmen, as well as see firsthand the latest capabilities of today's maritime services. ■

Pictured: Lt. Cmdr. Brian Pike, Lt. Yuliya Johnson, HMC Sean McCart, Capt. William Deniston and HM2 Mandissa Shaw. Photo by Mike Wilson

BDRD tent next to USS Carter Hall. Photo by Tommy Lamkin



Q&A *with Dr. Biswas*

By Sidney Hinds

Dr. Biswajit Biswas is the chief of Biological Defense Research Directorate (BDRD) Bacteriophage Science Division in the Department of Genomics & Bioinformatics. His research focuses on the use of bacteriophages to target and treat infections, especially those resistant to antibiotic treatment.

This interview has been edited and condensed for clarity.

SRH: Tell me how you first became interested in Bacteriophage research.

BB: My undergraduate degree in India was in Veterinary Medicine and Animal Husbandry. When I was working as a veterinarian in India, I noticed that a lot of antibiotics are used as growth promoters for agriculture. I observed that the use of antibiotics still allowed antibiotic resistant bacteria to grow after all the other bacteria had been killed off. This got me thinking "is there a better way for us to control bacteria?" I looked into the literature and learned that back in British India, the British used to use phages harvested from the Ganges River to control Cholera. There were no opportunities at that time that I could research phages, but it stuck in my mind. After I graduated from the University of Maryland one of the Ph.D. committee members of mine who worked with NIH called me and asked, "Are you interested in working with me?" I said yes and asked, "What is the topic?" He told me not to worry about it, but to "come here, and we'll discuss it, but first tell me if you want to work with me." I came to his office, and he told me he was interested in using bacteriophages to control the antibiotics resistance problem. I came to NIH, and that is how I began working with bacteriophages.

SRH: What sort of research did you do at the time?

BB: So this was back in 1987 that I joined NIH. Afterwards, I joined a private company where I developed bacteriophages therapy for enterococcus. I moved on to another private company after that which is where I learned about an Army grant to do research Acinetobacter baumannii. I applied for the grant and got funding for phage research.

SRH: And that's how you became interested in military medicine?

BB: Yes. That was in the private sector, but that's how I learned that the Army and other military branches were looking to develop bacteriophage therapy, and I learned that a lot of our warfighters suffer from this type of infection. They have blast wounds which become infected with the Iraqibacter, which is antibiotic resistant, and they must amputate hands, and legs to stop the infection. This is what encouraged me to look for a job in the military, to develop the sort of bacteriophage therapy they were interested in. I joined up with the Navy when an opportunity came to work at NMRC.

SRH: What research did you work on before you came to NMRC?

BB: I work at BDRD, initially developed bacteriophage for use against Bacillus anthracis (Anthrax). Our NMRC wound department was also interested in developing bacteriophage for Acinetobacter baumannii. Our marines get infected with these bacteria, so there was interest in research for developing a bacteriophage therapy for our warfighters. I applied a precision-based medicine approach. What that means is not applying phage blindly. My objective was to find the right phage for the right bacteria. This is not like antibiotics where you use one antibiotic to kill all bacteria, both good and bad. Phages are specific. Two patients can have the same infection, like A. baumannii, but both patients may not have the exact same variety. My strategy was to get the bacteria from the patient's sample, identify the bacteria, and find the right phage to treat those specific bacteria. This strategy requires the isolation of many, many diverse phages. Our leadership in the Navy and the wound department were convinced by this approach, so I collected hundreds of phages from overseas labs, where I would go and train others to collect phage samples, mostly from sewage water, where most phages are present. We collected these samples at BDRD, where we maintain a repository of phages. For a while it was not going anywhere, but we had these phages and were working on basic development research.

SRH: Prior to this, what was the state of bacteriophage research? How seriously was it considered in healthcare prior to the success of Tom Patterson's treatment?

BB: Bacteriophage research had been done previously in Russia and Poland, but there was no process to purify phages for safe intravenous injection, so phage treatments were only given via the rectal or oral route. In the US, phage research prior to the Patterson case was not mainstream work. Medical practitioners were not interested because there was always a doubt about whether it would work, and there weren't controlled studies available to provide support that it would work.

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When I joined NIH, we conducted controlled research in animals, but that doesn't get much interest. When Patterson's case happened and he survived, that convinced people. Most importantly, it convinced the doctors. Dr. Schooley took a risk injecting intravenously for him, but it changed everything. Dr. Schooley is very well-regarded in his field, so everybody said "oh! We can use phages for the treatment." Today, doctors have used phage therapy in dozens of cases under emergency use authorization from FDA in the US. and more globally in Belgium, Australia, and France. You look at the publications before and after Patterson's case, it's the difference between Hell and Heaven. The number of publications has jumped, and researchers are working to enhance phage therapy efficacy.

SRH: What sort of research have you been involved in since?

BB: In BDRD we are developing phage therapy against ESKAPE (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter* spp.) pathogens – mostly antibiotic resistant pathogens. We are collecting phages against these bacteria and developing animal models in the Combat Wound Infections Division. We are submitting grants to finance these projects and have received several to run basic research to develop therapies for our service members.

SRH: What is the objective of this current research?

BB: Well, a lot of bacteria are antibiotic resistant now. Our objective is to save our service members when they are wounded in battle and end up with these infections. That is our major objective. We are developing phage therapy to treat these organisms, mostly multidrug resistant bacterial infections. Background research is needed to successfully implement the phage therapy. A wound infection can have a biofilm – bacteria covers itself with a exopolysaccharide matrix that prevents penetration of antibiotics in wound bed; there are some phages that can penetrate biofilms and kill the bacteria. We want to find and identify these phages from environmental samples for wounds where biofilm is present, and make phage treatments more efficacious.

SRH: What is the significance of bacteriophage research, in your view? Why is it important to you?

BB: One reason is scientific interest – by 2040; millions of people will die annually from antibiotic resistant infections. Pharmaceutical industries are not spending money on new antibiotic treatments – it's time consuming, they aren't going to get much profit off them, and more bacteria are becoming resistant. When people are hospitalized with antibiotic resistant bacteria, it costs money every day to keep them in the ICU. Now when the antibiotics are not effective, we can use phage and antibiotics together. We found that when you use them together, sometimes you can overcome the antibiotic resistant problem. Their profiles can change, and they become antibiotic sensitive again, so the antibiotics we have in stock become useful again. Patterson's bug was resistant, but when we started phage therapy, his bacteria became antibiotic sensitive again. A more personal reason is that my son serves in the Navy. He got an infection in his leg on deployment, but luckily the antibiotic treatment worked, thank God. He was cured. I know these bugs will be resistant one day, and many more already are. These sorts of wounds happen to our servicemembers all the time, and if we develop these treatments, we can help them.

SRH: Overall, how have you found working and studying phages at NMRC?

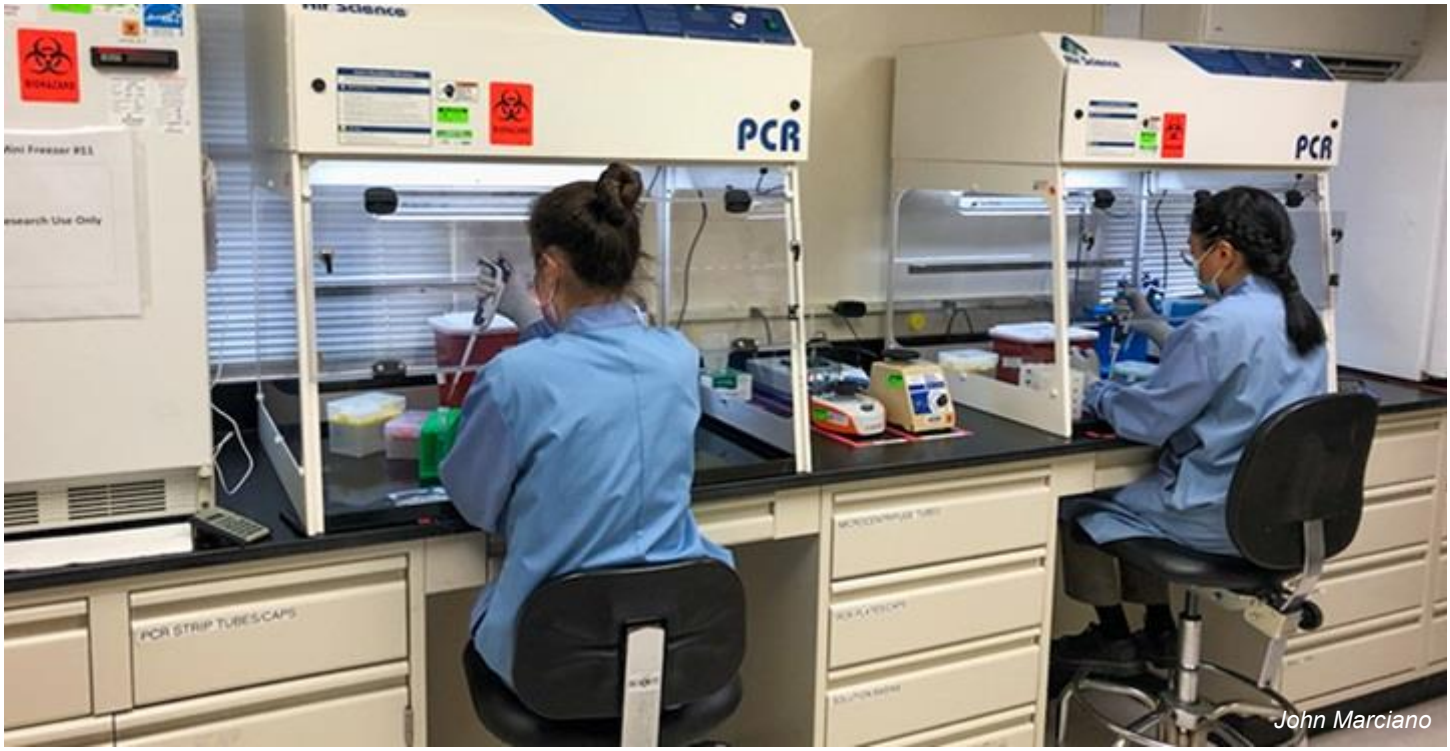
BB: Servicemembers like my son are at the forefront of our defense. We are the support. My objective is to help however I can and develop support for them here at home.

SRH: What is most important for the future of Phage research?

BB: Our leaders, and everybody, really, should know these phages are present everywhere, and that they don't hurt us. Many people don't know this. Phages are safe to use if you prepare and identify them properly. The FDA is very positive about phages now, and they recognize these are treatments we need to develop to overcome the antibiotic resistance problem. My major plan is to motivate the new generations of recruits who are working at NMRC to interest them in research on bacteriophages. I won't be here forever, so the new generation of scientists should know about it and be thinking about it.

SRH: So spreading awareness, and overcoming mindsets about what a bacteriophage is?

BB: Exactly. ■



John Marciano

Genome Sequencing Assists Research at Naval Health Research Center

Health.mil

The staff at Naval Health Research Center (NHRC) Opens Navy.mil added whole genome sequencing capability to their surveillance program. During the COVID-19 pandemic, NHRC brought on scientists and lab technicians to support this work and bioinformatics, which enriched their data collection and analysis capabilities.

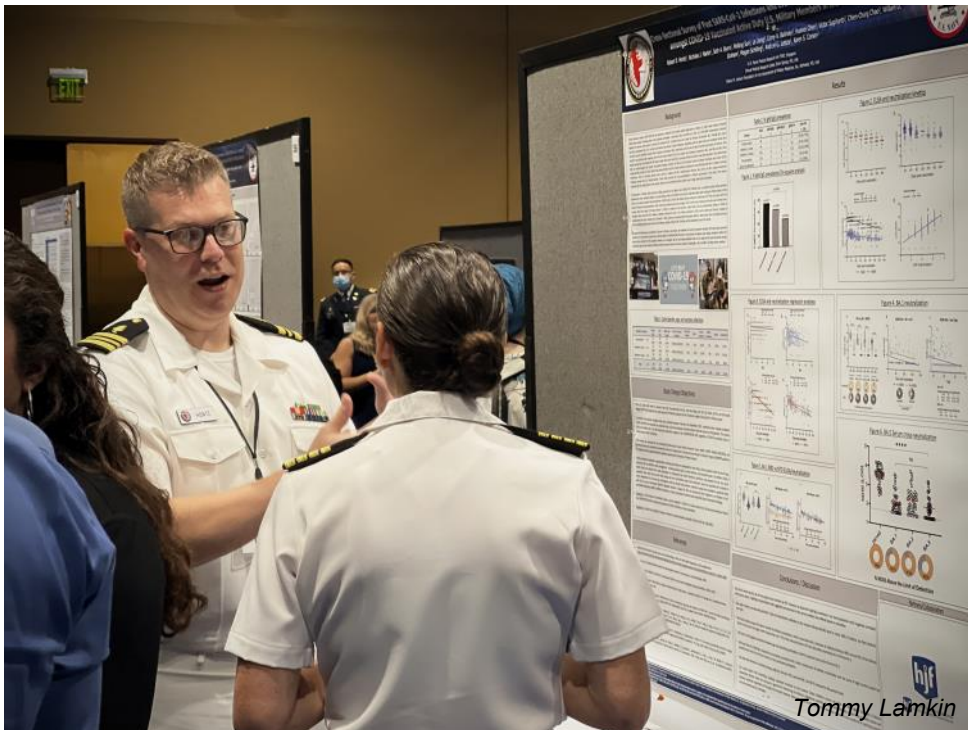
"Coordination was a team effort. Lab technicians worked together to test samples, identify candidates for WGS, and ultimately perform the sequencing reactions. This data was handed off to NHRC scientists for process and analysis," said U.S. Navy Lt. Cmdr. Michelle H. Lane, who holds a doctorate in biomedical science and is the director of operational infectious diseases at NHRC.

The U.S. Navy laboratory has access to a number of unique samples from naval vessels, U.S. and Mexico border populations, Department of Defense (DOD) beneficiaries, as well as recruits and trainees across all DOD services. These samples have been important to the DOD across multiple areas of responsibilities during the pandemic. NHRC continues to provide critical sequencing and epidemiological support for the COVID-19 efforts and have even developed a new serological quantitative assay that enables the differentiation between the immune response generated by natural infection compared to immunity generated through vaccination. Serology, in conjunction with molecular, sequencing, and bioinformatics data, will collectively inform a better understanding about vaccine efficacy metrics.

The Armed Forces Health Surveillance Division Global Emerging Infections Surveillance's Next Generation Sequencing and Bioinformatics Consortium supported their efforts.

"In addition to the financial support, the consortium has shared knowledge and offered support in troubleshooting new protocols and procedures. These resources were critical in initiating the new WGS program," said Lane.

She believes that this work is important to military and local civilian populations, adding, "Knowledge of diseases circulating in any population, military or civilian, is critical to keeping that population healthy. WGS offers a more precise, close-up look at these diseases and allows doctors and scientists to monitor disease evolution at a molecular level. All of this information contributes to more precise diagnoses and better treatment decisions."■


Tommy Lamkin

NAMRU-2 Officer Takes Part in 2022 DARPA Fellowship

By Sidney Hinds

Lt. Cmdr. Robert Hontz, a microbiologist with Naval Medical Research Unit (NAMRU)-2, participated in the Defense Advanced Research Projects Agency (DARPA) Service Chiefs' Fellowship Program (SCFP) from Sept. 20 – Dec. 16, 2022.

Fellowship participants shadowed program managers, meeting with subject matter experts and independent verification & validation partners to better act as informal liaisons between their organizations and DARPA.

"This fellowship has the potential to broaden the relationship between NAMRU-2 and DARPA and open new areas of cooperation," said Capt. Jonathan Stahl, commanding officer of NAMRU-2. "DARPA's areas of interest often intersect with our mission, and having an officer onboard with advanced knowledge of DARPA's internal structure and processes will greatly aid in fostering collaborative efforts."

Hontz shadowed nine different program managers in the DARPA Biological Technologies Office, focusing on medical countermeasures, diagnostics and biosurveillance tools, vaccine platforms, personal protective equipment, pathogen detection techniques and vector bioengineering. He also attended partner meetings at Georgia Tech, University of Georgia and Texas A&M, as well as meetings with partners from Vanderbilt, MIT, Harvard, Stanford and University of Michigan.

The SCFP began in 2008 as an opportunity to expose mid-grade uniformed officers to the DARPA mission, and to provide DARPA program managers with military personnel of various technical backgrounds to identify current and future programs that can fill gaps in the needs of the services. Once per quarter, DARPA liaison officers representing each branch of the armed services review applications from O4s and O5s to participate in the fellowship at their headquarters in Arlington, Va. Hontz said he would encourage fellow officers in the Enterprise to consider applying for future fellowships.

DARPA, established by DoD Directive in 1958, identifies and initiates advancements in technology to further U.S. national defense. DARPA's efforts are responsible for innovations that range from GPS, stealth aircraft, self-driving vehicles, and mRNA vaccines.

NAMRU-2, a command of Naval Medical Research Center headquartered out of Singapore, conducts research in cooperation with host nations in Vietnam, Laos, Singapore, Malaysia and Thailand to improve global health, ensure military force health protection and address infectious diseases such as malaria, dengue fever virus and gastrointestinal pathogens. ■

LOOKING Aft

with André B. Sobocinski

Historian, Bureau of Medicine and Surgery

The Taiwan Report and the Reactivation of NAMRU-2, 1953-1955

Any history of Navy Medical Research Enterprise would be incomplete without a chapter on Taipei, Taiwan—the home for the Naval Medical Research Unit No. 2 (NAMRU-2) for 24 years (1955-1979).

Taipei was the base of operations from where: the legendary Captain Robert Phillips conducted lifesaving research on cholera; and Navy Medicine led game-changing studies on Blackfoot disease and swine flu, demonstrated the role of attenuated Rubella vaccine, conducted vital medical surveys in the area, and trained hundreds of research fellows from Asian nations who in turn would make their own important contributions to medical science.

NAMRU-2's reputation for biomedical excellence and innovation began in World War II when it was organized at the Rockefeller Institute (now University) in New York City. When it was activated on Guam in January 1944, NAMRU-2 served as the Navy's only forward deployed operational medical research laboratory and played an important role in identifying and researching disease vectors while helping to mitigate threats like malaria and dengue on warfighters. Navy medical leaders recognized the value of the laboratory in the Far East, however, while in the midst of the post-war demobilization and facing a loss of personnel to operate NAMRU-2, the Bureau of Medicine and Surgery (BUMED) placed it on an "inactive status" in 1947. This was accepted as a temporary measure until a more permanent and "practicable" home could be found.

For the next seven years, NAMRU-2 remained always on the cusp of reactivation. With the outbreak of the Korean War (1950-1953), Navy medical leaders recognized the heightened need for command like NAMRU-2 that could conduct medical surveillance and disease research in support of warfighters.

During the conflict the Navy deployed the Fleet Epidemic Disease Control Unit No. 2 (FEDCU-2) aboard USS Whidbey (AG-141) to the Korean Peninsula to screen returning service personnel for dysentery, malaria and parasitic infections. Whidbey also conducted a series of high-profile port visits to Taiwan where she provided medical support to the Chinese Nationalist Navy, and performed epidemiological surveys. The surveys helped bring greater attention to several infectious diseases and parasitic disorders in the area deemed of potential importance to military operations. In 1953, at the behest of the Office of Naval Research (ONR), BUMED coordinated a special mission to Taipei, Taiwan in order to "survey the potentialities for medical research of military importance."

This joint ONR-Bureau of Medicine and Surgery (BUMED) mission was led by Capt. Wilbur Kellum, Commanding Officer of the Naval Medical Research Institute (NMRI) in Bethesda, Md., and comprised of Cmdr. (later Capt.) Robert Phillips, Bureau of Medicine and Surgery (BUMED) Research Division, Rear Adm. James Shannon, U.S. Public Health Service, Dr. Lee Farr, Medical Directory, Brookhaven National Laboratory, and Dr. George Mirick, Professor of Medicine, Johns Hopkins University School of Medicine. Phillips, had been a NAMRU-2 plankowner in World War II, and had long lobbied for its reactivation.

Continued on next page

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After arriving in Taipei, Taiwan on October 1, 1953, the team worked with representatives from the Office of the Naval Attaché, The Military Assistance Advisory Group (MAAG), and the Foreign Operations Administration Mutual Security Mission (MSA), to coordinate visits to civilian and military medical sites. A chief focus of the mission was to review Taiwan's two primary areas of medical activity—the civilian area centering around the National Taiwan University College of Medicine and University Hospital as well as the military medical group centered around the National Defense Medical Center. The team assessed the physical facilities that were available, the conditions under which the scientists might enter the country, and their acceptance by the official and scientific members of the Taiwanese community.

After leaving Taiwan on October 10, 1953, the team reported to Adm. Felix Stump, Commander in Chief Pacific and U.S. Pacific Fleet, and then released their findings in what was called simply, the "Taiwan Report." The document outlined nine reasons for reactivating NAMRU-2 on Taiwan. These included:

1. Taiwan affords a promising field for research in tropical medicine including an opportunity to explore medical conditions in many areas of Southeast Asia.
2. Enthusiastic support from the Chinese National Government, its military and civilian medical communities and a willingness to assist at all levels in facilitating the establishment of a U.S. Navy medical laboratory.
3. Availability of scientists for collaborative research.
4. Well-organized civilian and military hospital systems.

The proposal was endorsed by SECNAV, CNO, CINCPAC, BUMED, the National Research Council's Committee on Naval Medical Research, the State Department, as well as the Foreign Operations Administration Mutual Security Mission to China.

The National Taiwan University agreed to supply spaces (42,900 square feet) on a token-lease basis for an initial term of 20 years with the U.S. Navy remaining responsible for making improvements to the building, and providing "fixed and nonfixed research supplies and collateral equipment." The initial estimated cost of lease, supplies and personnel involved in reactivation was $240,000 in 1954 (abt. $2.6 million in 2023). This number was later increased to $338,000 (abt. $3.6 million in 2023) prior to activation. The new spaces included facilities for administration, biochemistry, physiology, X-ray, bacteriology, virology, entomology, photographic laboratories, a 20-bed ward, animal quarters and storage.

On May 9, 1955, NAMRU-2 was formally activated in Taipei under the command of Capt. Robert Phillips. The United States formally signed an agreement to conduct research in Taipei with the Government of the Republic of China on October 14, 1955. The laboratory was commissioned on November 6, 1957.

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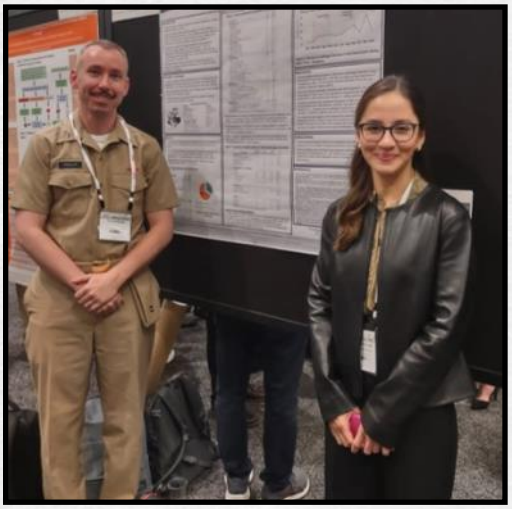
Yarbrough, O.D. to BUMED Policy Board. Medical Research Facility in the Far East; policy relative to establishing same as a semi-permanent installation, 25 February 1954. BUMED General Correspondence Collection, Record Group II. National Archives II in College Park, MD.

SCOPE NEWS

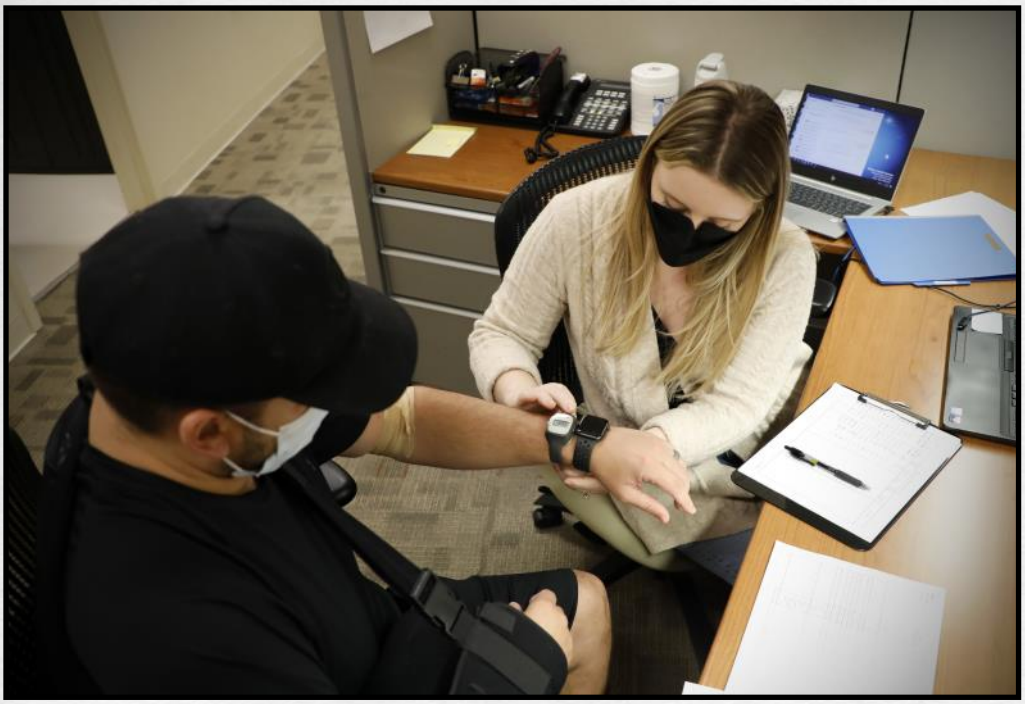
A closer look at Navy Medicine's R&D enterprise

SAN DIEGO (Nov. 4, 2022) – Dr. Valerie Stander, a research psychologist with Naval Health Research Center (NHRC), speaks with visitors to the NHRC booth on Broadway Pier during San Diego Fleet Week. *—Erika Ramirez*



SEATTLE (Oct. 31, 2022) Faviola Reyes, (right) a study coordinator with the Naval Medical Research Unit-6 Bacteriology Department, poses with Lt. Tyler Moeller, Bacteriology Department head, at the 2022 American Society of Tropical Medicine and Hygiene Annual Meeting.
—Lt. Cmdr. Danielle Pannebaker

SAN ANTONIO (Dec. 14, 2022) Dr. Yoon Hwang, (center) of Seoul, South Korea, a research microbiologist, assigned to the Craniofacial Health and Restorative Medicine Directorate, is recognized by Capt. Gerald DeLong, commanding officer, and Chief Science Director Dr. Sylvain Cardin of Naval Medical Research Unit-San Antonio, as the Fiscal Year 2022 "Science Staff" Civilian of the Year during Mission Impossible held at the Tri-Service Research Laboratory.*—Burrell Parmer*



BETHESDA, Md. (Nov. 8, 2022) Kate DeTizio, a clinical trials coordinator with Naval Medical Research Center's Clinical Trials Center, fits a volunteer participating in the Melatonin and Vaccine Response Immunity and Chronobiology Study with a wearable activity monitor. The study, also known as "MAVRICS," examines participants' immune systems after flu vaccination to determine if melatonin and its impact on sleep patterns may affect immune response. — *Tommy Lamkin*

SILVER SPRING, Md. (Oct. 27, 2022) Lt. Cmdr. Chaselynn Watters presents accomplishments of Naval Medical Research Center (NMRC)'s Biological Defense Research Directorate to staff of the National Museum of Health and Medicine during the NMRC 80th birthday celebration. *– Michael Wilson*

GROTON, Conn. (Dec. 15, 2022) – Staff with Naval Submarine Medical Research Laboratory prepare dishes for the command holiday potluck. *—Emily Swedlund*

SILVER SPRING, Md. (Oct. 25, 2022) Leadership from the Naval Medical Research & Development enterprise commands pose for a group photo at the NMRC 2022 Commander's Leadership Conference.*– Michael Wilson*

LIMA, Peru (Dec. 23, 2022) Administrative and science personnel with Naval Medical Research Unit-6 pose for a photo during a command outing and holiday breakfast. *– Toane Zuloeta*

GROTON, Conn. (Dec. 15, 2022) – Capt. Matthew H. Jamerson, commanding officer, Naval Submarine Medical Research Laboratory presents the Military Health System Research Symposium award for 2nd Place Poster in the 3rd Poster Session to Dr. Jeffrey Bolkhovsky and Dr. Kristina Diaz at the command holiday potluck.
—Emily Swedlund

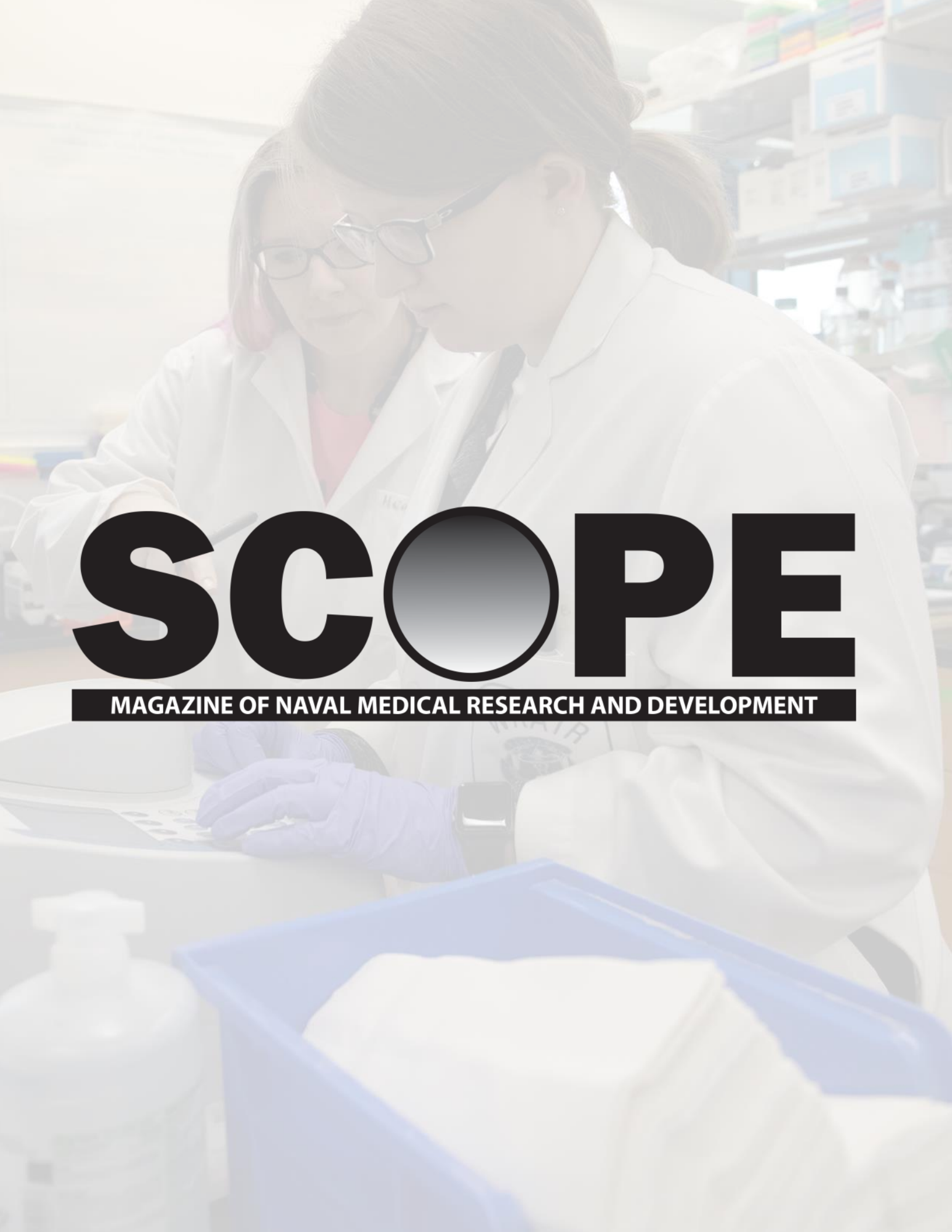
SAN ANTONIO (Nov. 18, 2022) Sara BlackCloud, a financial management analyst for Naval Medical Research Unit-San Antonio, poses for a Native American Heritage Month portrait. Born in San Bernardino, Calif., and raised in San Diego, BlackCloud has been a Navy civilian for six years. She first enlisted in the Air Force in 2002 an the Army in 2008 deploying in support of Operation Enduring Freedom in Afghanistan.
— Burrell Parmer

DAYTON, Ohio (Nov. 29, 2022) Dr. Richard Arnold and Lt. Cmdr. Erik Anderson (right) discuss potential en-route care medical research opportunities with representatives from the Cleveland Clinic in Naval Medical Research Unit Dayton 's static MV-22 Osprey aircraft at Wright-Patterson Air Force Base, Ohio.
— Zachary Wilson

SILVER SPRING, Md. (Dec. 11, 2022) – Lee Acker, a financial counselor with the Naval Support Activity Bethesda Fleet and Family Support center, provides guidance to Sailors and Soldiers assigned to Naval Medical Research Center on managing their thrift savings plans.
—Michael Wilson

SAN DIEGO (Dec. 9, 2022) – Staff with Naval Health Research Center play bingo at the command holiday party.
—Erika Ramirez

SILVER SPRING, Md. (Sept. 28, 2022) Kael Nelson, ombudsman for Naval Medical Research Center, speaks with Lt. Brian Williams and Lt. Jessy Calderon about his role volunteering for the command.
—Michael Wilson



SCOPE

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